Rohde & Schwarz Topex

VoiBridge

VoIP-GSM Gateway

Installation Manual

2012

ROHDE&SCHWARZ

Dear Client!

Thank you for purchasing the ROHDE & SCHWARZ TOPEX S.A. product and congratulation for your wise choice.

Our VoiBridge equipment has the following features:

Applicability

- Gateway between cellular networks and VoIP or PSTN networks
- Enterprise IP telephony convergence solution
- Mobile operators offering their services to Business
- Telesales centers calling cellular networks

Capacity:

- up to 4 cellular channels
- up to 4 SIM cards (1 SIM per channel)
- 2E1 interfaces - in & out (for PRI variant) SIP and H.323 protocols supported
- Advanced incoming call routing based on
- Caller- ID
- Advanced call-routing of outgoing calls
- SIM Server Ready
- Advanced security with integrated firewall
- Available in multiple configurations:
- 2 or 4 channels VoIP to GSM gateway
- 2 or 4 channels VoIP to UMTS/HSDPA gateway
- 2 or 4 channels 2PRI to GSM gateway
- 2 or 4 channels 2PRI to UMTS/HSDPA gateway
- Least Cost Routing by: prefix, time and date, SIM usage (load balancing), portability info or Caller-ID
- Works with any IP-PBX or Softswitch based on SIP or H323 protocols,hybrid PBX with\ VoIP trunks and ISDN PBX
- Mobility Extension Feature – allows for mobile phones act as PBX interior lines
- SIM Server Ready – works with SIM Server NAT Traversal capabilities
- DISA with customer predefined voice navigation messages
- Number portability integration with external database
- SIP to H323 and H323 to SIP conversion
- Advanced SMS capabilities

Features

- Send SMS from Web, SMS2Group, SMS to E-mail and E-mail to SMS
- Missed calls notifications by SMS for Mobility
- Extension numbers
- Advanced Callback functions – by ring or SMS
- Integrated LAN and WAN port - possibility to use public and private IP addresses
- SNMP integration – allows for remote configuration via SNMP protocol
- Billing: persistent, easy to access
- Configurable alarms by e-mail, SMS or phone call in case of low ASR or hardware failures
- Easy to use web based interface
- Live traffic monitoring, Statistics: ASR, ACD
- Configuring via SSH
- Configuring via direct serial access
- Full control (root access): troubleshoot, update software, and customize/extend system

Conformity!

ROHDE&SCHWARZ

Rohde & Schwarz Topex S.A.

Declaration of Conformity

No: 394

We, designer and manufacturer

Rohde & Schwarz Topex
Feleacu 10, 1st District, Bucharest
014186, ROMANIA
www.topex.rohde-schwarz.com

Declare under our sole responsibility that the product:

Product Name: **TOPEX VoiBridge**

Product Description: **VoIP – GSM / UMTS Gateway**
Quad band GSM: 850/900/1800/1900 MHz
Tri Band UMTS/HSDPA: 850/1900/2100 MHz

to which this declaration relates is in conformity with the essential requirements and other relevant requirements of the R&TTE Directive (1999/5/EC).
The product is in conformity with the following standards and / or other normative documents:

Health & Safety (Art. 3(1)(a)):
EN 60950-1:2001

EMC (Art. 3(1)(b)):
EN 55022 :2006
EN 55024 :2001

Spectrum (Art. 3(2)):
EN 301 511 V9.0.2

Product has applied the **CE** conformity mark.

Supplementary information:

Technical file held by:
The technical documentation relevant to the TOPEX VoiBridge product is held at Rohde & Schwarz Topex Company at the address mentioned above.
RF parameters of GSM engines included by TOPEX VoiBridge were performed by Cinterion Wireless Modules GmbH, Siemensdamm50, 13629, Berlin, Germany, who released Declaration of Conformity about it.
RF parameters of UMTS engines included by TOPEX VoiBridge were performed by Sierra Wireless Inc, 13811 Wireless way, Richmond BC, Canada who released Declaration of Conformity about it.

Place and date of issue (of this DoC): 05th of April 2012, Bucharest, Romania

Signature: _____ Signature: _____

President Mr. ADAMESCU Dan Q.A Director. Mrs. PĂUNOIU Carmen

S. C. Rohde & Schwarz Topex S.A. - two-tier managed company; IBAN EUR: RO91BRDE410SV18500744100; IBAN USD: RO12BRDE410SV18800114100;
Trade Registry reg. no. J40/21109/1994, Fiscal registration code: RO 6502278, Capital Share: 240000 RON

WEEE Directive Compliance

WEEE Directive

This symbol applied on your product or on its packaging means that this product fulfils the WEEE Directive. The product shall not be recycled as household waste; it will be disposed separately as sorted waste.
Regarding to WEEE Directive the recycling EE equipments must be accomplish separately in purpose of preserving natural resources and to avoid the occurring negative effects about human health and environment. The acquired product shall not be treated like household waste and will be given to a specialized company.

! Please do not dispose your product as unsorted waste (household waste), recycle it to protect the environment. Separate the packages according to waste disposal options and sort it for recycling.

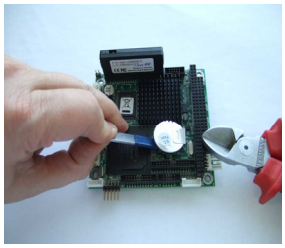
For supplementary information contact us to:
Phone: +4021 408.39.00 or www.topex.ro

2006/66/CE Directive Compliance

This symbol applied on your product or on its packaging means that product includes a battery (CR2032 Lithium type) which is subject to apart collecting from household and WEEE waste.
The battery will not be recycled as household or WEEE waste; it will be disposed separately in purpose to protect the human health and environment and preservation of natural resources.
For this at the end of product life remove the battery from the product performing the operations described bellow:

1. The battery is comprised by processor card. For removal open the product case or extract the card and identify the battery and its placement on PCB.
2. Cut the lamella with a clipper.

3. Take off the battery from its holder using a tweezers or another suited tool.



4. Push the battery till this leaves the socket.

5. Deliver over the battery or collect it with similar waste and deliver together to a specialized company for battery treatment.

. Please do not dispose the battery of your product as common waste (household waste), recycle it to protect the human health and environment. For supplementary information contact us to:
Phone: +4021 408.39.00 or www.topex.ro

Record of Changes

ISSUE	DATE	NUMBER OF PARAGRAPH	A* M D	TITLE OR BRIEF DESCRIPTION	MADE BY
A-D	2009-2010	All	A,M	First issue and different changes	C. Malide V. Sfetcu
E-G	2011	Changes according to product evolution	A, M, D	Change power supply mode (from 12Vcc in 230VAC)	V. Sfetcu
H	2012	Cover, conformity	A,M	Added conformity information	V. Sfetcu

A – Added, M- Modified, D- Deleted

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1 About VoiBridge equipment

TOPEX VoiBridge equipment is a gateway of the Topex family of devices named "Voxi Series". Currently this family includes VoiBridge, VoxiPlus and VoisTel.

VoiBridge is the junior member of the family, a VoIP GSM / UMTS / CDMA Gateway suitable for calls termination and origination (VoIP to Mobile Networks and Mobile Networks to VoIP).

Functional features:

- function as a BRIDGE between a voice over IP network and several mobile carriers. The basic version features GSM channels.

- the GSM board of the equipment can be enabled to make up to four calls simultaneously from SIP phones to GSM network and from GSM network to IP phones.

- provide direct interconnection of VoIP and GSM networks through SIP signaling protocol. It enables calls between mobile networks and IP networks. TOPEX VoiBridge allows you to convert VoIP-to-mobile into mobile-to-mobile traffic in the simplest and most efficient way.

- include SSR (SIM Server Ready) feature, it supports SIM Server capabilities for remote and central storing of any number of SIM cards. The basic function of the system is the voice capability but it is equipped with all functions necessary for such use and provides a very high comfort in this mode.

- act as an interface between any IP PBX and different mobile networks (GSM / GPRS, CDMA, UMTS or HSDPA).

- SMS service (Short text messages) - for remote control purposes, diagnostic SMS can be sent in regular intervals from the gateway to a selected mobile number. These additional functions enhance the utility value of the product.

- no extra equipment (an external GSM telephone, etc.) is needed for normal operation. All programmable parameters are default-preset in such a manner that you can start your telephone traffic at the moment you connect the Ethernet and supply cables, antenna and SIM card and set the IP parameters.

- the intelligent routing of incoming calls accelerates the connection of incoming calls and makes calling more comfortable. Unlike mobile telephones, TOPEX VoiBridge does not expose you to the RF electromagnetic field while making calls.

- Comfortable and advanced configuration by web interface

VoiBridge main features:

- 4 GSM channels (Quad Band modules)
- VoIP or 2E1 (in & out)
- SIP & H.323 protocols
- Least Cost Routing mechanism
- Direct Inward Dialing (DID)
- CDR generation
- Web interface operation & administration
- Asterisk PBX Server Integration
- Support Topex SIMSERVER integration

2 VoiBridge INSTALLATION

To assure the correct operation of the TOPEX VoiBridge equipment, follow the next stages:

1. Unpack and Verify the content of the package;
2. Mount the equipment on the chosen location;
3. Identify the connectors and connect the cables (Ethernet and serial for the console);
4. Insert the SIM cards;
5. Connect the mobile antenna;
6. Power up the equipment.
7. Basic configuration

2.1 Check VoiBridge package content

The delivered TOPEX VoiBridge content must comprise the items accounted below. Please, check if you receive all the items!

	Item	Pieces
☑	VoiBridge equipment	1
☑	Ethernet Cable	1
☑	Power supply cable	1
☑	Mobile Antenna	1
☑	CD with Manuals (Installation Manual and Web Interface Manual)	1
☑	Warranty Certificate	1

2.2 Mounting (hardware installation)

A. Installation conditions:

- Topex VoiBridge equipment is conceived to work indoor environmental only (rooms, halls, offices)
- The environmental parameters must be within the range:
  - Operating temperature: from 5 to 50^0C;
  - Relative humidity: from 10 to 85 %, non-condensing;
- The dust and the prolonged exposure to sun radiation must be avoided;
- Must NOT be used in a flammable or explosive environment, or in locations where toxic or flammable gases may be accumulated;
- The location of the equipment must be airy, open, without obstacles or objects that could prevent the proper operation of the gateway.
- The equipment must be positioned safely as far as possible from the heat sources, direct sunlight, heavy-duty electric equipments and from equipments which generate radio interferences.

B. The installation:

☞ place de VoiBridge equipment on a flat surface strong enough to hold the weight of the equipment together with its cables (power supply, Ethernet, Serial). A good place for equipment installation is represented by a desk, table or shelf.

After the hardware installation of the equipment, the cables must be connected, and the equipment powered up.

2.3 Connecting the cables

To assure an adequate operation of the TOPEX VoiBridge equipment, the cables must be connected properly, as is described further:

☞ ***Achieve the serial connection:***

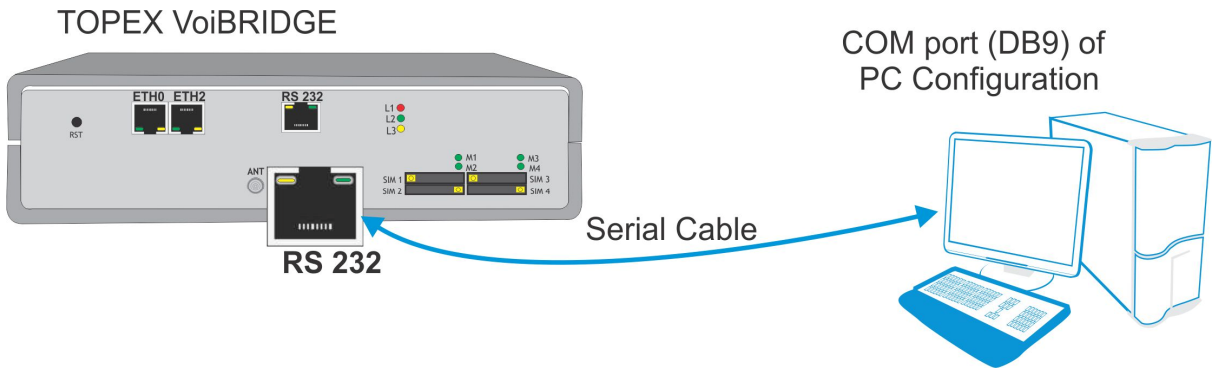
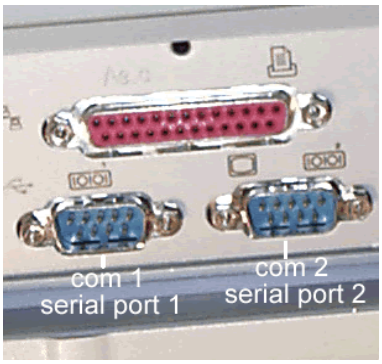


Figure 1 - Connecting the serial cable

The special serial cable must inserted with its RJ45 end in the serial connector labeled RS232 (RJ45) located on the front panel of the TOPEX VoiBridge equipment, and with the other end in the correspondent connector (DB9) of your PC.
The serial cable is connected to the PC on a RS-232 serial port (DB9 muffle), for instance COM1 or COM2 as shown in the image to the right.

For this type of equipment, the serial connection ***cannot*** *be used for the OAM program.*



The serial connection of the Topex VoiBRIDGE has the following settings:

Bits per second - 115200;
Data bits – 8;
Parity – None;
Stop bits - 1;
Flow Control – None.

Please make sure that the COM port of your PC is configured accordingly!

Then you may connect the serial cable from the Topex equipment to the COM1 port of your computer, as shown in figure above.

☞ *Achieve the local network connection (LAN):*

The TOPEX VoiBridge equipment is connected on the local network (LAN) or to the Internet through the standard UTP Ethernet cable (CAT-5). Since the switching system of the equipment is auto – negotiation (10 / 100) and auto-crossover you can use:

a. a straight cable in case of connecting to a LAN (switch, hub);

b. a crossover cable in case of connecting the equipment directly to the Ethernet port of your computer.

The b. kind of link is recommended when you connect to the Topex gateway in order to change its IP address: if you connect directly to it, you can avoid both disruptions to the local network in case of conflicting IP addresses, as well as loss of connection when you are in the middle of performing changes.

The network cables are inserted with one end in the RJ45 connector (labeled ETH0 or ETH2) from the TOPEX VoiBridge equipment, and with the other end into a PC, switch or hub. The Ethernet connection directly to your PC is used for configuration of the equipment by means of the OAM program.

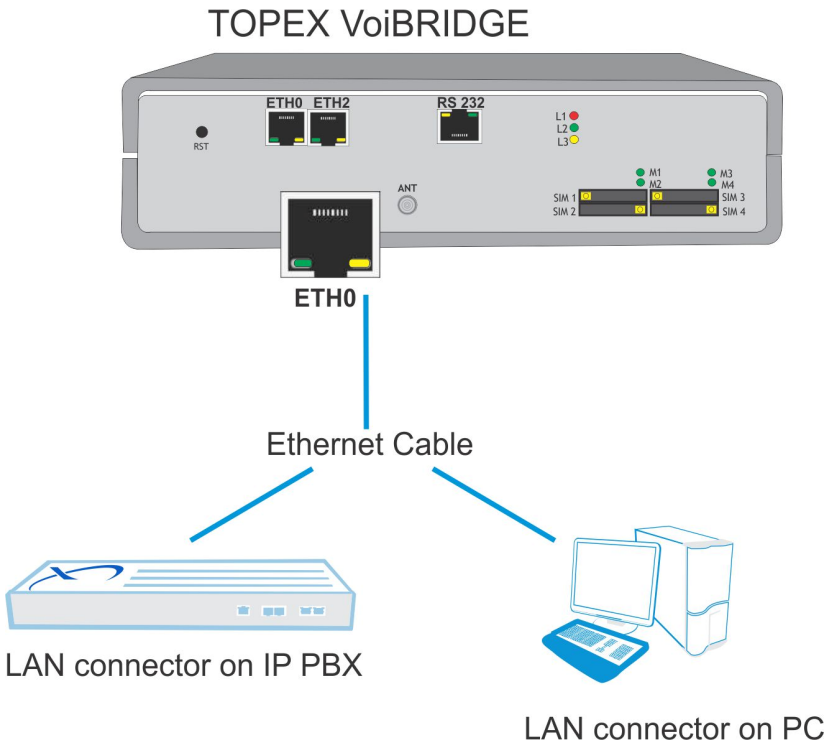


Figure 2 – LAN connection for Topex VoiBridge

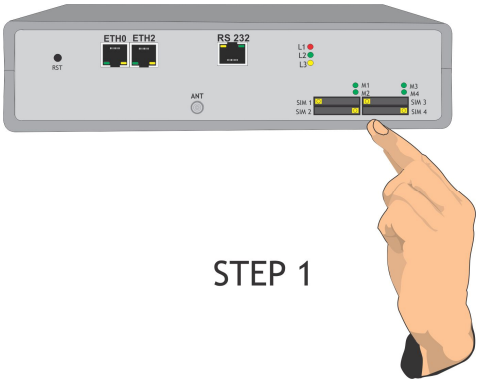
2.4 Insert the SIM cards

TOPEX VoiBridge equipment features four SIM slots for inserting up to four mobile subscriber cards. Each SIM card corresponds to a mobile (GSM / UMTS / CDMA) module. The VoiBRIDGE equipment can use the SIM cards from different mobile operators; the only condition is for the SIM cards to be activated by them.

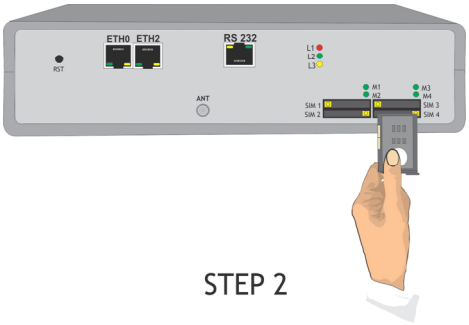
The procedure of inserting the SIM cards is detailed in the steps below:

1. Push the little yellow button for extract the SIM holder from the VoiBridge equipment.

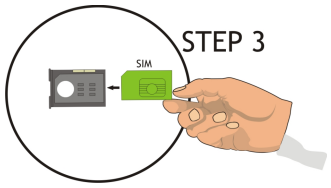
Note: Because its small dimensions, you can push the button using an object with a solid edge such as a screwdriver.



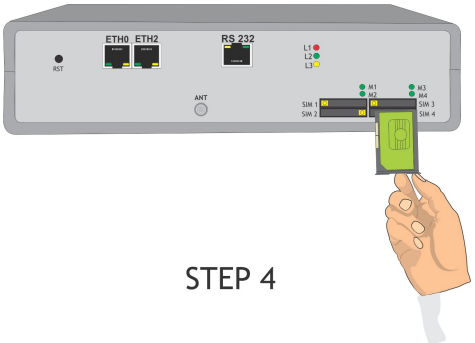
2. Pull out the holder for the SIM card.



3. Insert the SIM card into the holder, with the cut (notched) corner orientated upwards and the side with contacts toward you.



4. Insert the holder with the SIM card back into the slot and push to close. Be careful not to drop the SIM out of the tray and to insert the holder properly into the slot!



***Note**: The operation described above must be performed for all SIM card insertion and also when you want to replace (change) the existing SIM card with a new one.*

***Warning:** When inserting / extracting the SIM card the equipment must be powered off to avoiding damaging the internal modules.*

2.5 Connecting the antenna

Depending on the device type, TOPEX VoiBridge has either one or several connectors for antenna(s). You should pick the type of antenna that is best for your current location (depending on the installation site, the current field strength, frequencies used by the mobile carriers you want to connect to y etc.).

The TOPEX equipment may use different types of individual (discreet) or collective antennas. The standard issues are stick-type magnetic-base antennas, while upon request, special antennas are available, such as high-gain, directional Yagi type (see details below).

The antennas have a 2,5 m length connection cable and a base with magnet for fastening to a ferrous support. The base is heavy, so the antenna will stand upright even if you place it on a flat surface that is not metallic.

Note: The delivered antenna corresponds to the mobile module type from the equipment. Below is presented an example of an omni directional magnetic antenna with its respective specifications.

Type: “magnetic base antenna”

Directivity: omni directional

Frequency: Multiple bands (890 to 960, 1710 to 1880, 1850 to 1990 MHz and 1920-2170 MHz)

Gain: 2 dbi

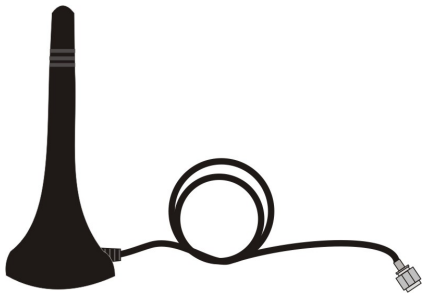
Polarization: vertical

Height: 72,5 mm total, 43mm active stick

Cable: RG174, length 2,5m

End connector: SME female

Magnetic base: diameter 2,8 cm



Mounting the antenna

To ensure a good quality of transmission and reduce radio interference, use the antenna(s) shipped in the VoiBridge package. During installation, care must be taken that the antenna base (usually the mounting bracket) is grounded. Grounding of the antenna base improves reception of the mobile networks.

Connect the antenna for the mobile networks as shown in figure 12 (the **RF** connector of antenna cable by screwing at the **ANT** connector):

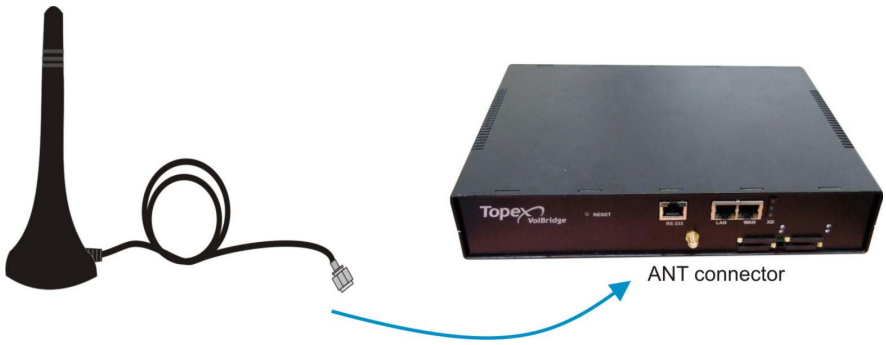


Figure 3 – Mobile antenna connection

Warning! Don't use excessive force. Make sure the antennas are securely screwed into the RF connectors, but do NOT use a spanner or screw key, which could damage the antenna connectors! Tighten the flange lightly, by hand.

Notice:

1. The VoiBridge equipment unit and its antennas should be placed such as to be as far as possible from appliances or office equipment that is sensitive to radio interference (microwave ovens, copiers, TV sets, PC displays, and multimedia systems). For best results, try to find for the antenna a place of maximum signal reception.
2. In addition, the antenna must NOT be located near heavy-duty equipment that may generate electromagnetic interferences, such as electric motors or heaters.
3. The antenna must be mounted in such was as the minimum distance to human beings to be of at least 20 cm, in order to avoid the human exposure to its radiations. Remember that the equipment transmits for longer periods of time, being used for multiple voice calls, so the radiation will be accordingly **higher** than for an ordinary 2G/3G mobile phone that is used only infrequently, by a single person.

2.6 Power up the equipment

For the equipment power supply, use only the supply cable (standard) that is included in the TOPEX VoiBridge package.

Before plugging in the outlet, make sure that the mains voltage value meets the specifications written on the label of the equipment (230VAC).

Furthermore, make sure that the antenna has been connected. If you connect the gateway to the power supply without an antenna, the GSM module transmitter might get damaged.

The muffle of power supply cable must be inserted into the receptacle placed on rear of equipment and then inserted into outlet

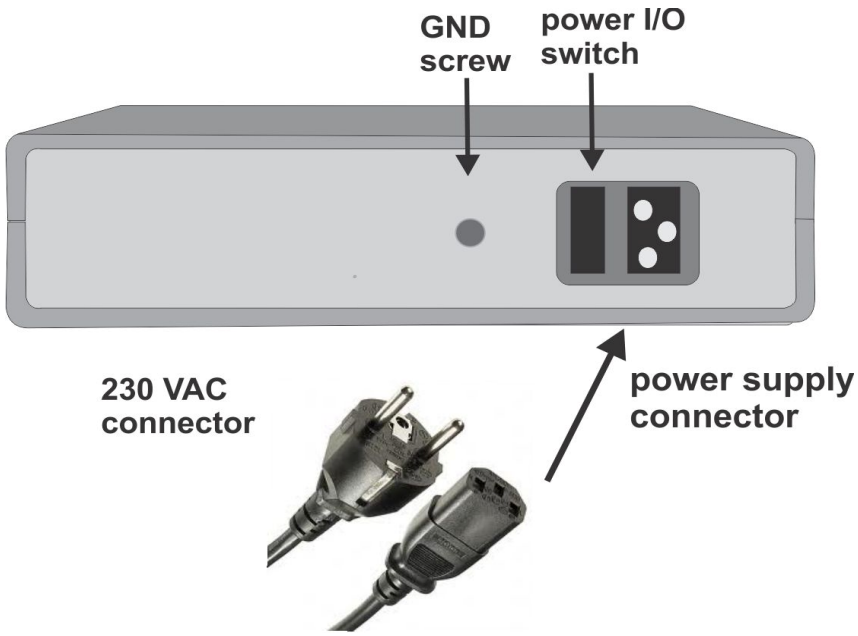


Figure 4 – Supply the equipment

There is a POWER switch on the equipment, press it in order to start the equipment.

Note: The 230 V_{AC} socket-outlet shall be placed near the equipment and must be easily accessible.

Following the power up of the TOPEX VoiBridge, the red LED located on the front panel of the equipment must be on.

3 VoiBridge CONFIGURATION

The VoiBridge configuration can be accomplished after all the connections were achieved and the power up was done. This operation can be performed using the web interface incorporated by TOPEX VoiBridge equipment.

For basic configuration of the Topex gateway, perform the following steps:

- Access the web interface
- Change the default IP address
- Configure the equipment from the web interface

3.1 Access the web interface

☐ **type: http://192.168.110.15 (the default IP address as the URL)**

After you access the web browser, the following window will appear and ask you about the user name and the password:

⌨ **type user name** - **"admin** "

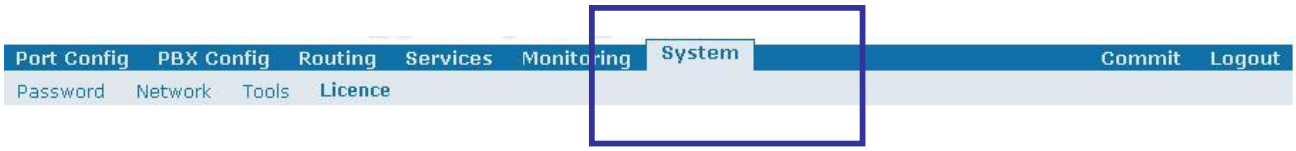
⌨ **the password** - "**99admin11"**

☞ Press "**LogIn"** button

3.2 Changing the IP Address

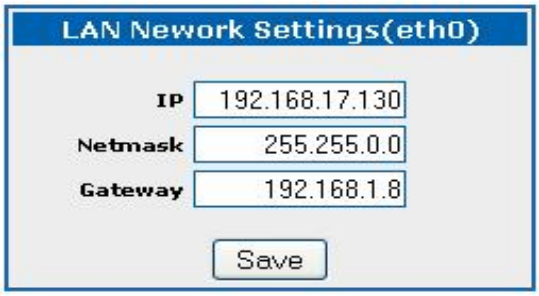
Initially the equipment is delivered with a **default IP address 192.168.110.15.** This must be changed with an IP address from the IP address range in your LAN network.

☞ ***Access the System menu***



☞ ***Access the Network option from System menu***

☞ ***Insert your network parameters: IP Address, Netmask, Gateway***



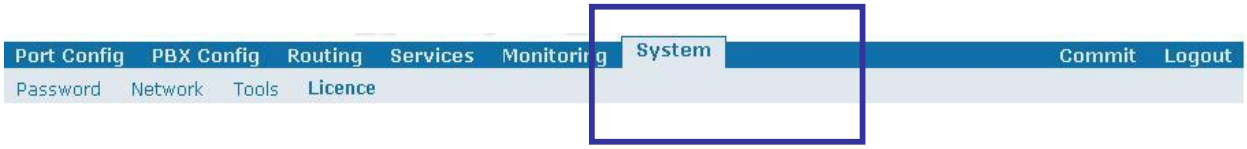
☞ ***Press "Save" button in order to activated the new parameters: IP Address, Netmask, Gateway and then "Commit"***

The equipment will reboot and you will be able to login with http on the address given in the LAN Network Settings menu.

3.3 Changing the default Password

Initially the equipment is delivered with a **default username: "admin" and password:"99admin11".** For security reasons we advise you to change the password used for accessing the web interface.

☞ ***Access the System menu***



☞ ***Access the "Password" option from System menu***

☞ ***Insert the new password***

☞ ***Press "Save" button in order to activated the new password and then "Commit"***

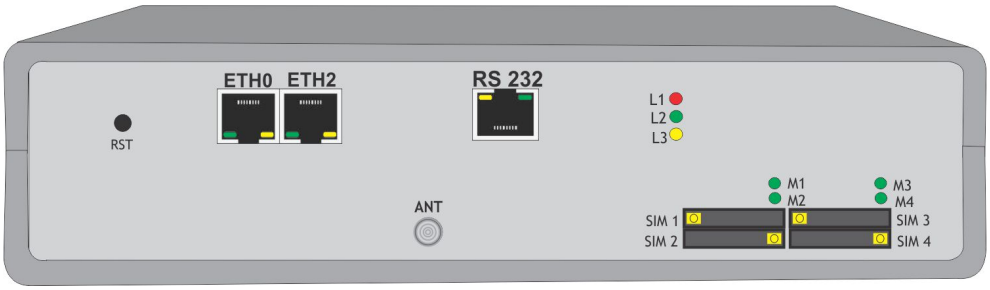
Use the commit button to make your changes permanent. By using only the Save button, changes will be available until first reboot.

3.4 Configure the equipment

The VoiBridge configuration is available by using the web interface, the operation instructions are described in Web Interface Manual which founds out on the TOPEX CD.

4 Status Monitoring

TOPEX VoiBridge has several optical indicators (LEDs), located on the front panel of the equipment, that show the status of the device:



a. Three LEDs located on the upper row with the following meanings:

1. The red LED “L1” lights to show the proper supply of the equipment;
2. The green LED “L2” indicates that the Linux kernel is running. It pulses faster or slower, depending upon the operations performed by the embedded software;
3. The yellow LED “L3” lights up or to show reading from the non-volatile memory

b. **Four green LEDs** located on the bottom row above the SIM connectors corresponding to the four GSM / UMTS / CDMA modules. They show info about the respective mobile modules and SIM card, as detaild in the table below:

Table 1 – LEDs (blinking) for the mobile modules

LED status		LED significance
On time (ms)	Off time (ms)	
200	200	Mobile module in initialization state
1500	100	Module unregistered to the mobile network, the SIM from the board is selected
1500	100	Module unregistered to the mobile network, the SIM emulator is selected
100	100	
100	1500	Module registered to the mobile network, the SIM from the board is selected
100	100	Module registered to the mobile network, the SIM emulator is selected
100	1500	

Each Ethernet connectors features a pair of LED indicators, with this meaning:

c. The green LED of the LAN connector shows the existence of data traffic in the Ethernet interface;

d. The yellow LED of the LAN connector shows the Ethernet connection speed. When the LED is off, the data rate is only 10 Mbps, and when the LED is on the data rate rises to 100 Mbps;

e. Likewise, the green LED of the WAN connector shows the presence of data traffic in the Ethernet interface;

f. The yellow LED of the WAN connector shows the interface data rate of the Ethernet connection. When the LED is off, the interface data rate is 10 Mbps, and when the LED is on, the data rate rises to 100 Mbps.

5 VoiBridge TECHNICAL DESCRIPTION

TOPEX VoiBridge belongs to “VOXI series”, a family of versatile equipments or voice and data communications based on the IP and mobile network.

TOPEX VoiBridge has a modular architecture that offers the possibility to configure the equipment based on user’s requirements.

The main function of the TOPEX VoiBridge equipment is VoIP – GSM Gateway (SIP Trunking).

The hardware structure contains:

- Mechanical build (metal case)
- System boards

5.1 Equipment versions

VoiBridge Gateway provides superior voice technology for connecting IP-based telephone systems, soft switches, and IP PBXs to GSM / CDMA / UMTS networks.

This professional VoIP GSM Gateway connects directly to the IP-based system using the existing VoIP networks, and cost-effectively routes incoming and outgoing fixed line, cellular and VoIP calls – all in one box.

TOPEX VoiBridge gateway can be delivered in two different hardware platforms according to the number of GSM channels and user needs.

TOPEX VoiBridge equipment can be provided in:

- base capacity configuration – 2 or 4 GSM channels
- advanced (extended) configuration – maximum 12 GSM channels

The base variant represents a small and compact equipment provided with one GSM board with 2 up to 4 GSM modules and a processor board. This is the small version of the VoiBridge gateway.

Figure 5 – TOPEX VoiBridge – base variant

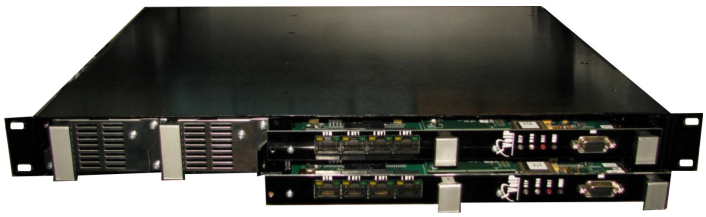


Figure 6 – TOPEX VoiBridge – advanced (extended) configuration

The second one is integrated in 1U rackable equipment with 4 slots for plug-in cards. This is the advanced version of the equipment and can be equipped with up to 3 GSM cards which mean a maximum of 12 GSM modules – TOPEX VoiBridge advanced configuration.

TOPEX VoiBridge		Number of GSM channels	Number of GSM boards
Version 1 (base)	Version 2 (advanced)		
X		2	1
X		4	1
	X	4	1
	X	6	2
	X	8	2
	X	10	3
	X	12	3

5.2 System Cards

TOPEX VoiBridge is built on compact and reliable equipment with up to 4 GSM channels in small version and up to 12 GSM channels for advanced version.

The equipment includes two PCB cards enclosed in a small and compact cabinet which contains several functions:

- VoIP interfaces: LAN and WAN
- GSM interfaces
- Processor function

The small version of TOPEX VoiBridge features up to four Quad Band GSM, UMTS or CDMA modules which allow an easiest connection to the Mobile Network. The extended configuration version features up to 12 such mobile modules.

5.2.1 Processor Card

The “brain” of the equipment is the Processor card, which includes a flash memory that stores the embedded applications for the TOPEX VoiBridge equipment. The size of the memory is either 128 or 256 MB, depending on the configuration.

The card has several optical indicators (LEDs) located on the front panel of the TOPEX VoiBridge equipment, for showing the system status. There are three LEDs located towards the right side of the panel and two built-in LEDs for each connector labeled RS 232, ETH0, ETH2.

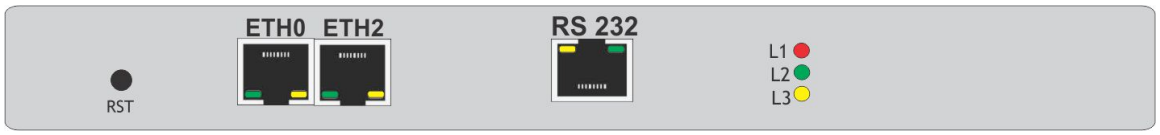


Figure 7 – Processor card connectors

On the front panel of the procesor card, from left to right, we have:

- A reset button for the reset of the system configuration (labeled RESET);
- A serial connector (RJ45 type) for maintenance, programming and administration of the equipment (labeled RS232);
- An 2 X RJ45 connector for the connection to the local network (labeled ETH0, ETH2);

The Processor card has several optical indicators (LEDs), located on the front panel of the equipment, that show the status of the device. The LED’s significance is detailed in chapter 2.5 – Status Monitoring.

5.2.2 GSM / CDMA / UMTS Card

The GSM card that is used by TOPEX VoiBridge, is the interface for VoIP calls over mobile networks and accomplishes the mobile functions of the equipment. The PCB of the GSM card features internal connectors for mounting up to four Quad Band modules for GSM, GPRS/EDGE, UMTS, HSDPA/HUSPA or CDMA /EVDO mobile networks.

Note: The mobile modules installed on the equipment correspond to the client's request and should be chosen according to the specifications of the mobile networks in the area of operation. You may ask for modules for different technologies and operating frequency bands (GSM 900, DCS1800, PCS 1900, CDMA800, CDMA2000, 3GPP, etc)

The card features four slots (holders) for SIM cards which correspond to the Mobile Modules from the Board. Thus the SIM cards are numbered and every SIM card matches to the appropriate module.

Table 2 – Correspondence between SIM Slots and GSM Modules

SIM Slot	GSM Module
SIM1	Module 1
SIM2	Module 2
SIM3	Module 3
SIM4	Module 4

For receiving the signal of mobile network the GSM card is equipped with either:

- A single RF circular connector for an external GSM antenna – it uses an internal 4 to 1 antenna combiner/splitter for all GSM modules.
- The advanced version features four RF connectors, one for each GSM modules. This allows you to set external **directional** antennas, each targeted towards the base station of a specific mobile carrier.

The mobile card feature also four status indicators, one per each GSM module. The indicators are green LEDs, located above the SIM cards slots. The LED's significance is detailed in chapter 4 – Status Monitoring.

6 APPLICATIONS

The applicability and the means of use of the VoiBridge equipment are presented below.

a) the equipment functions as SIP Trunking between an IP PBX and the mobile telephony network (GSM / UMTS / CDMA).

One or several subscribers registered to an IP PBX equipment initiate calls to the mobile telephony network.

These calls are transmitted to the VoiBridge equipment, which achieves the translation of the IP calls into mobile calls.

Finally, by using the TOPEX box we will have a mobile to mobile conversation instead of an IP to mobile call.

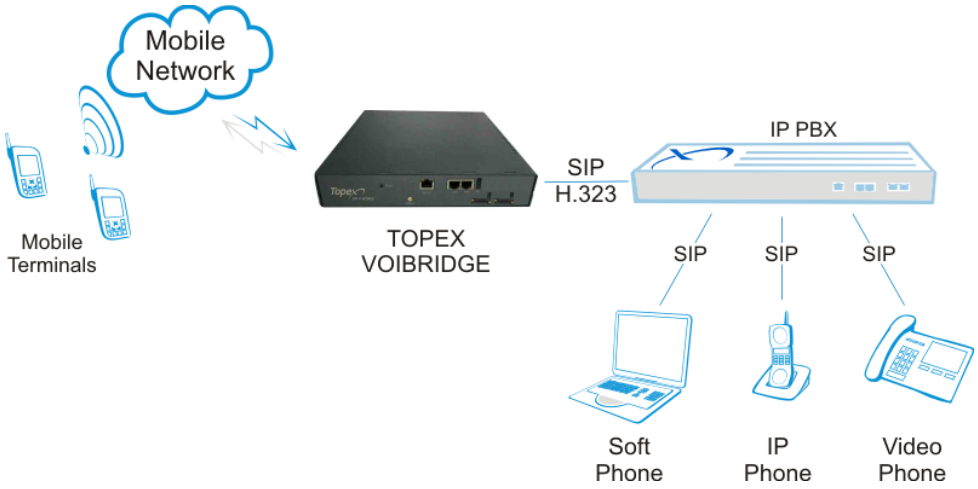


Figure 8 – SIP Trunking between IP PBX and the mobile network

b) the equipment allows the translation of the calls initiated from PSTN network, and transported over the IP network into mobile network.

A FXS phone call is initiated and converted to IP through a VoIP gateway. The IP packet is transmitted through the Internet toward the VoiBridge equipment.

TOPEX equipment achieves the conversion of the IP call into mobile to mobile call through its embedded GSM / UMTS / CDMA modules.

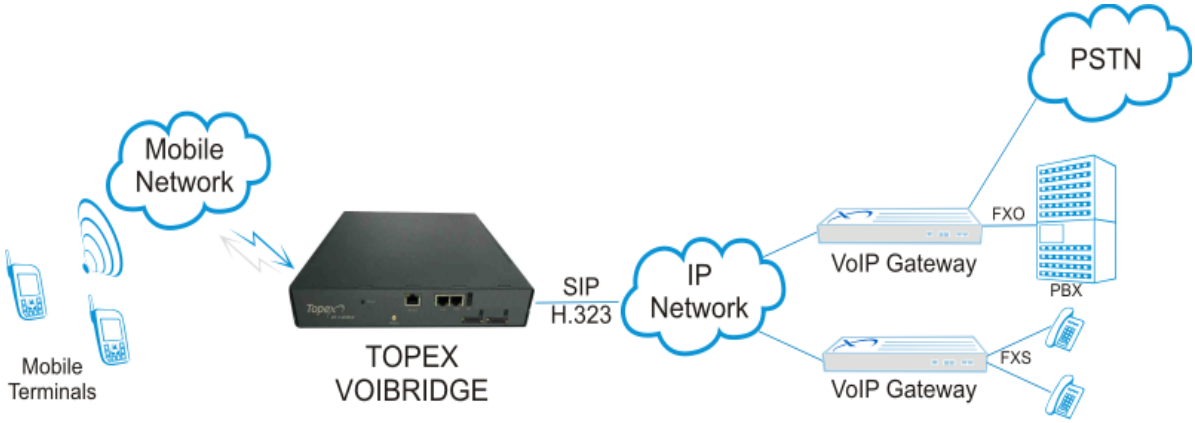


Figure 9 – Fixed to mobile conversion

c) VoiBRIDGE achieves mobile to mobile calls through the IP network.

The costs savings are achieved by the transport of call through the IP network instead a direct call between two different mobile networks, or between two mobile networks from different countries.

A GSM user initiates a call to the local TOPEX VoiBridge equipment. The call is directed to GSM module belonging to the same carrier as the caller. The VOXI box sends dial tone, so the calling party can enter the phone number of the destination.

The mobile call is converted to a VoIP call and it is transmitted on the Internet.

At the other end you have another VoiBridge box. Here the VoIP call is converted back into a mobile call to the local carrier and sent to the destination.

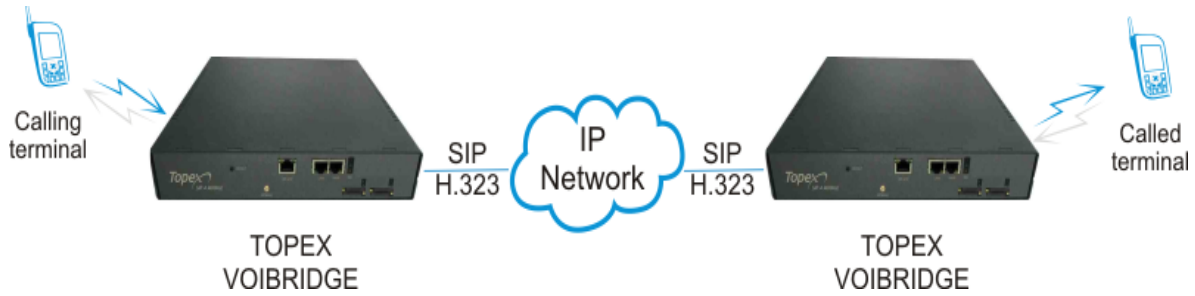


Figure 10 – Mobile to mobile call through the IP network

7 TECHNICAL SPECIFICATIONS

Product Name	**TOPEX VoiBridge**
Mechanical Construction	Metal case
Processor card (PG /E1/VoiP)	Redundancy for the version with 2 processor card 2 VoIP interfaces
Ethernet capacity	1 LAN interface on the PGVoIP card 1 WAN interface on the PGVoIP card Connector types: RJ45 – 10/100 BaseT
Mobile Card	Up to 4 Quad Band GSM / UMTS / CDMA modules 1 RF(built in splitter) or 4 RF circular connectors for mobile antennas 4 SIM cards per GSM board
HSDPA engine	Networks frequencies: 850/1900/2100 MHz WCDMA Power class 3 (+24dBm) 850/900MHz GSM/GPRS/EDGE GSM Power class 4/ EDGE E2 1800/1900 MHz GSM/GPRS/EDGE GSM Power class 1 /EDGE E2
GSM engine	Networks frequencies: 900 / 1800 MHz & 850 / 1900 MHz
Codecs used	G.711 – up to 60 voice channels G.723.1, G.729ab – up to 30 voice channels
Signaling protocols	SIP v.1, v.2 H.323 v.2, v.4
Mobile Antennas	Different individual antennas or collective splitter antenna
Power Supply	AC / DC Adapter, Class I Power AC Input Voltage Range: 90 264 Vac / 1.6 A DC Output Voltage: +12VDC / 3,4A
Operating temperature	From +5^{o}C up to +50^{o}C
Storage temperature	From -5^{o}C up to +60^{o}C
Humidity	10% - 85 % without condensing

8 OPERATING ENVIRONMENT

In order to assure proper operation of the TOPEX VoiBridge equipment the following requirements must be met:

- Choosing of a proper location (an adequate ventilation must be assured);
- Operating temperature range: from +5 up to + 50^{0}C;
- Storage temperature range: from -5 up to + 60^{0}C;
- Relative humidity: from 10 to 85 %, non-condensing;
- The dust and the prolonged exposure to sun radiation must be avoided;
- Must NOT be used in a flammable or explosive environment, or in locations where toxic or flammable gases may be accumulated;
- Mechanical shocks must be avoided;
- Must NOT be used in an environment with high level of EMI (electromagnetic interferences) that is in close proximity to high power equipment such as electric motors or heaters;
- Must NOT be placed near copiers, PC monitors, TV sets or other audio-video appliances;
- The outlet where the power supply cable is inserted to set up the operation of the TOPEX VoiBridge must not be broken or damaged.

9 REGULATORY INFORMATION

Note: When using our device or connected equipment, the following basic safety precautions should always be followed to reduce risk of fire, electrical shock and other personal injury.

- For a proper installation and functioning of VoiBridge follow the instructions described in this manual or other documentation.
- Always install equipment in a location and environment for which it is designed.
- For locally powered ac electrical outlet use: only operate within the specified transformer power voltage indicated.
- For locally powered AC electrical outlet: Avoid placing the device power cable where it can be exposed to mechanical pressure as this may damage the cable.
- Do not insert any object into equipment slots that is not part of the product.
- Do not disassemble the product. Contact Rohde& Schwarz Topex service department if service or repair its is required.

FCC Part 15 EMC recommendation

- **Note:** This equipment has been tested and found comply with the limits for a Class A digital device, pursuant part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

- Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- Modifications not expressly approved by the manufacturer could void the user`s authority to operated the equipment under FCC rules.

APPENDIX 1 - Connection Cables

The TOPEX VoiBridge equipment is shipped with all the cables that are necessary for connections:

- One length of the standard Ethernet cable. It should be inserted in the LAN or WAN connectors (RJ45) located on the front panel of the equipment. If you need a longer Ethernet cable, or two pieces of cable, for achieving connection both on LAN and WAN, you must purchase them separately ;
- The special serial cable, which must be inserted into the serial connector labeled RS232 (RJ45) located on the front panel of the TOPEX VoiBridge;
- The power supply cable that must be inserted on the special connector (DIN) located on the back panel of the equipment.

Notice: The supply cable is always connected at the power adapter end.

Table 3 - Pin out for the UTP straight cable connector

Pin	Color	Wire pairs significance	Color	Pin
1	Orange – White	Rx pair, reception	Orange – White	1
2	Orange		Orange	2
3	Green – White	Unused pair	Green – White	3
6	Green		Green	6
5	Blue – White	Tx pair, transmission	Blue – White	5
4	Blue		Blue	4
7	Brown – White	Unused pair	Brown – White	7
8	Brown		Brown	8

Table 4 - Pin out for the serial cable connectors

Pin	Color	Wire pairs significance	Color	Pin
3	Black	Rx – reception	Black	3
5	Green	GND – ground	Green	5
6	Yellow	Tx - transmission	Yellow	6

Note: *The other pins are not used!*

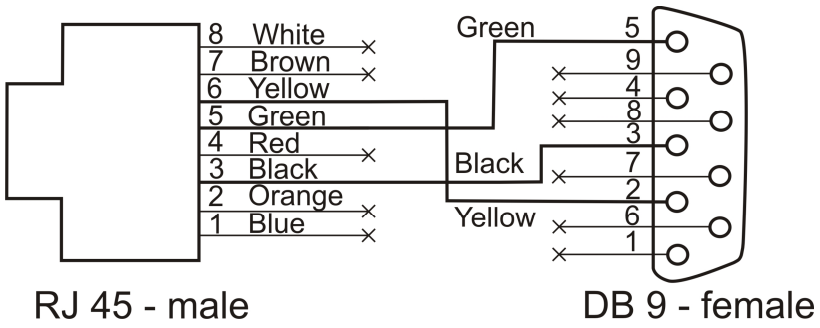
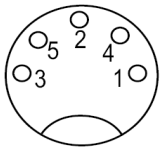
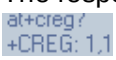
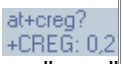
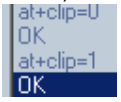


Figure 11 - The pin out for the serial cable

Table 5 - Pin out for the power supply cable connectors

Pin Assignment	
	PIN1: COM PIN2: COM PIN3: +5VDC PIN4: -Vout PIN5: +Vout

APPENDIX 2 – AT commands

AT Command	Purpose	Response
AT	Allows the user to check the functionality of the GSM module	Should be "OK" in case of success:
AT+CPIN?	The GSM module is interrogating about pin code. This is a useful method to check if a SIM card is plugged in a GSM module.	- ERROR - there is no SIM installed or there is another error; - READY - if no PIN code is required; - SIM PIN - the SIM is waiting for PIN code; - SIM PUK - the SIM is waiting for PUK code
AT+CREG?	This AT command is used to check if the module is registered within the GSM network.	The response is:   +CREG:<n>,<stat>,"xxxx", "xxxx" where <stat> can be: - stat = 0 - the module is not registered and does not try to register to a GSM operator; - stat = 1 - the module is registered within a GSM network; - stat = 2 - the module is not registered but is trying to register to a GSM operator; - stat = 3 - the registration is not allowed; - stat = 4 – unknown; - stat = 5 - the module is registered and he has roaming.
AT+CLIR=<n> where n=0 for default, where n=1 for not sending the identity and n=2 to allow the sending the identity	This command is used to enable or disable the sending of the identity (caller ID)	The module is responding with "OK" with a delay that depends upon the loading of the GSM network. Until the response is waiting an additional AT command must not be sent to the module.
AT+CLIR?	To check the settings for identity	 +CLIR:1,4 - identity not sent +CLIR:2,4 - the identity is sent +CLIR:0,4 - default value
AT+CLIP=<n> where n=0 for not displaying the identity of the calling part and n=1 to allow displaying of the calling part	To display or to not display the identity of the calling part in case of a call through the monitored GSM port	The module should be responding with "OK", like this: 

identity		
ATD<number>; Where <number> is the number to be dialed	This is an useful method to make a call test directly from the GSM module	The response can be: OK - the destination part has answered NO CARRIER - the destination part does not respond or it is not in the covered area NO CARRIER BUSY - the destination part is busy
ATA	Is used for responding to an incoming call. When incoming call is routed through a GSM module which is in monitoring state, the "RING" word will appear at each 5 seconds. If CLIP is activated then a message with the calling number will be displayed: +CLIP: "calling number" ,xxx	The GSM module should be responding with "OK". ata ERROR
ATH	The command is used to end a call	The GSM module is responding with "OK" ath OK
AT+COPS=?	This command will detect and display all the active GSM operators in the area of the gateway	+COPS: (2,"RO ORANGE","ORANGE" ("22610"),(3,"RO CONNEX","CONNEX", "22601"),(3,"RO Cosmorom","Cosmorom","226(
AT+COPS?	This command will display the operator's name to which the GSM module has registered	at+cops? +COPS: 0,2,"22610" OK
Sending a SMS	First Command: - AT+CMGF=<n> where <n> is 1 for text format and 0 for PDU format. The value to be used is 1.	- The module will respond with "OK".
	- AT+CMGS="number" This command is used to complete the destination phone number.	- The module will respond with ">".
	- The command which will send the SMS messages is: @send <text message>	- The response for confirmation is: +CMGS: <message reference> OK - The response for error is: +CMS ERROR: <error>

APPENDIX 3 – Additional Commands

To see the listing of all AT commands that are available on your particular equipment, you must issue the command "**help**":

set pin sim sss pppp	Used to set the pin codes for GSM modules at module "sss". The pin code is "pppp";
set pin range sss sss pppp	Used to set the pin codes for GSM modules in range "sss" to "sss". The pin code is "pppp";
set/res moni ppp	used to put / extract a GSM port from monitoring state
send gsm at.....	Used to dial a number
set debug ppp ppp	Used to start debugging on a port. The port for debugging purposes is completed in "ppp" section: for example to activate debug for port 1 the command is "set debug 1 2"
set view ppp	Must be sent to port "ppp" after the command "start debug ppp ppp" in order to activate the debugging facility
res debug ppp ppp	Used to stop debugging on port "ppp". The port is completed in "ppp" section: to stop the debugging for port "1" the command is "res debug 1 2"
res view ppp	Must be sent to port "ppp" after the command "res debug ppp ppp" in order to deactivate the debugging facility
set tmax sss sss ttt	Allows you to define a time interval ('ttt') after which a SIM will be blocked. “sss” is the sim coresponding value. You may specify a range of SIM cards values. Value of 'sss' may be computed as follows: number of card (shown in "Port status) * 8 + number of sim (0,1,2 or 3) for the first GSM module or number of card (shown in "Port status) * 8 + 4 + number of sim (0,1,2 or 3) for the second GSM module.
set calls	It is used for displaying the total number of call attempts ("TCalls"), answered calls ("T spech"), total duration of calls ("Dcalls"), total duration of speaking ("Dspech) and the number of calls released from "A" side ("Arelease") and from "B" side ("Brelease")
set calls off	This command is used to reset the previous values
set block ppp ppp	Command used to send block message on SS7 signaling to channels in range ppp ppp
res block ppp ppp	Command used to send unblock message on SS7 signaling to channels in range ppp ppp
set loop ppp ppp	Command used to send loop message on SS7 signaling to channels in range ppp ppp
res loop ppp ppp	Command used to send unloop message on SS7 signaling to channels in range ppp ppp
kill call port	This command disconnects an active call on a GSM module. The position of the GSM module is specified by the "port" parameter
test callbqack id	This command is used for making tests over the quality of voice. In this chapter this command is detailed presented

10 GLOSSARY

Ethernet - Standard for wired computer networks. Ethernet networks are connected by cables, switches and hubs, and move data around. For wired connections, TOPEX VoiBridge provides one Ethernet port for the local network (LAN) and one port for the WAN network.

IP – Acronym for **Internet Protocol**. It is the protocol from TCP/IP that directs the way data is sent from one computer to another on the Internet. The messages are divided into data packets, routed from the sender network to the receiver network and there re-assembled in the right order to re-create the original message. Because a message is divided into a number of packets, each packet can, if necessary, be sent by a different route across the Internet. These data packets can arrive in a different order than the order they were sent in. The Internet Protocol just delivers them. It's up to TCP protocol (Transmission Control Protocol) to put the packets back in the right order.

GSM – Acronym for **Global System for Mobile Communications** - The dominant digital cellular technology for mobile telephone networks in Europe. GSM (formerly called "Groupe Speciale Mobile") utilizes the 905-915 MHz and 950- 960 MHz reserved spectrum to provide roaming capability across 18 countries in Europe. GSM 1900, the North American version of GSM, allows the standard to be used in the 1,900 MHz frequency band, which the U.S. Federal Communications Commission and Industry Canada have allocated for personal communication services (PCS).

LAN - Acronym for **Local Area Network** (computer network that spans a relatively small area). A group of computers, workstations and associated devices that share a common communications line or wireless link and are located in a relatively limited area, typically inside the same office building. The communications link that interconnects these computers allows any device of the network to interact with any other from the same network.

PBX - Acronym for **Private Branch eXchange**. The PBX is a small, enterprise version of the larger central switching office of the phone company. A PBX is a private telephone switch. It is connected to groups of trunks (junctions) from one or more central offices and to all of the telephones at the location (subscribers, local extensions) served by the PBX. Current exchanges are in fact PABX, automated PBX, which don't require a human operator to route the calls.

PSTN - Acronym for Public Switched Telephone Network(s).

SIP – Acronym for **Session Initiation Protocol**. A protocol proposed standard for initiating, modifying, and terminating an interactive user session that involves multimedia elements such as video, voice, instant messaging, online games, and virtual reality. It is one of the leading signaling protocols for Voice over IP, along with H.323. SIP clients traditionally use TCP and UDP port 5060 to connect to SIP servers and other SIP endpoints. SIP is primarily used in setting up and tearing down voice or video calls.

UMTS – Acronym for **Universal Mobile Telecommunications System.** The first of the third-generation (3G) cellular networks, UMTS is being designed to offer speeds of at least 144 Kbps to fast-moving (e.g., vehicle-based) mobile devices, and offer an initial 2 Mbps to campus sites — designers expect to increase this to 10 Mbps.

VoIP – Acronym for **Voice over Internet Protocol**. It achieves the voice calls routing over the Internet or over any network based on the IP protocol, even in the local networks. Two principal standards are available for the VoIP

WAN - Acronym for **Wide Area Network**. A system of LANs, connected together. A WAN is a network that connects computers located in separate areas, (i.e., different buildings, cities, countries). The Internet is a wide area network.

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The manufacturer reserves the right to modify the product and manual for the purpose of technical improvement without prior notice. The manufacturer guarantees the good functioning of the product provided that it has been correctly installed and the directives for storage and usage have been respected.

The warranty implies exclusively repairing or replacing the defective unit. The warranty does not include any indirect losses or loss of profit. The manufacturer is not liable for any damage, whether direct, indirect, special, incidental, or consequential, as a result of using the VoiBridge equipment.

No part of this manual may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, recording, or otherwise, without the prior written permission of the company.

It is certified hereby that the VoiBridge equipment is manufactured in concordance with the legal provisions concerning responsibility towards the quality of delivered products, fulfills the quality parameters specified in its “Users Manual” and is fit for the purpose for which it has been designed.

It also warrants that the equipment will perform substantially in accordance with the accompanying documentation.

Any comments, suggestions and proposals of yours concerning our products are welcome and we are gladly waiting for your feedback.

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